PANIMALAR ENGINEERING COLLEGE
DEPARTMENT OF ECE
INTERNAL ASSESSMENT I
EC 8651 – TRANSMISSION LINES AND RF SYSTEMS

Date: **Max. Marks:** 50
Class: III ECE A, B, C, D & E **Duration:** 2 Hours

PART A $(5\times2=10)$

1. Define characteristic impedance.
2. When does reflection occur in a line?
3. Find the attenuation and phase constant of a wave propagating along the line whose propagation constant is $1.048\times10^{-4}\angle88.8^{\circ}$
4. Define reflection coefficient.
5. Find SWR and reflection coefficient of a 50Ω transmission line when it is terminated by a load impedance of (60 + j40) ohm.

PART B $(2\times13=26)$

6.a) An open wire line which is 200 Km long is properly terminated. The generator at the sending end has V = 10V, f = 1 KHz and internal impedance of 500 Ω. At that frequency, the characteristic impedance of the line is (700+ j100) ohms and $\gamma = 0.007 + j0.04$ per Km. Determine the sending end voltage, current and power and the receiving end voltage, current and power. (13 Marks)

(Or)

b) Derive the expression for voltage and current at any point on a transmission line in terms of receiving end voltage and current. Also derive it for a line terminated by Z_0. (13 Marks)

7.a)i) Derive the input impedance of open and short circuited lines and also derive the expression of transfer impedance. (7 Marks)

ii) A line has the following primary constants R = 100Ω / Km, L = 0.001 H/Km, G = 1.5 μmho / Km,

C = 0.062 μF /Km. Find the characteristic impedance and propagation constant at frequency 1000 Hz. (6 Marks)

(Or)

b) i) The characteristic impedance of a uniform transmission line is 2039.5 Ω at a frequency of 800 Hz. At this frequency the propagation constant was found to be $0.054\angle87.9^{\circ}$ Determine the values of primary constants. (6 Marks)

ii) Explain in detail about waveform distortion and also derive the condition for minimum attenuation in a distortionless line. (7 marks)

PART C $(1\times14=14)$

8.a) What is loading? Explain the different types of loading and also prove that distortionless line can be achieved by means of loading.

(Or)

b) A generator of 1V, 1000 cycles, supplies power to a 100 mile open wire line terminated in 200 ohms resistance. The line parameters are R = 10.4 ohms per mile, L = 0.00367 henry per mile, $G = 0.8\times10^{-6}$ mho per mile, C = 0.00835 μF per mile. Determine the following parameters; Reflection coefficient, Sending end impedance, Sending end current, Receiving end current, Receiving end voltage, Input power, Power delivered to the load and Efficiency of transmission line.

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PANIMALAR ENGINEERING COLLEGE
DEPARTMENT OF ECE
INTERNAL ASSESSMENT II
EC8651 – TRANSMISSION LINES AND RF SYSTEMS

Date : **Max. Marks :** 70
Class : III ECE A, B, C, D, E **Duration :** 2 Hours

PART A $(8 \times 2 = 16)$

1. List the assumptions made while analyzing transmission lines at radio frequencies.
2. What is a lossless line? What are its constants?
3. A high frequency line has C = 24 pF/m and distributed inductance of L = 480 nH/m. Calculate the characteristic impedance and phase velocity.
4. If the reflection coefficient of a line is $0.3\angle -66^\circ$, calculate standing wave ratio.
5. What are nodes and antinodes in standing waves?
6. Write the significances of impedance matching.
7. Why short circuit stubs are preferred over open circuit stubs?
8. Find the location of first voltage maxima from the load of a line if the reflection coefficient is $K=0.47\angle -45^\circ$

PART B $(3 \times 13 = 39)$

9. a) i) Define standing wave ratio and derive its expression. (5 Marks)

ii) An antenna as a load on a transmission line produces a standing wave ratio of 2.8 with a voltage minimum 0.12λ from the antenna terminals. Find impedance at the antenna terminals if $R_0 = 300\ \Omega$ for the line. (8 Marks)

(Or)

b) Derive the expression of input impedance of a dissipationless line. Also derive it for open and short circuit lines. (13 Marks)

10.a) i) What are quarter wave transformers? Derive its expression of Z_0 and list its applications. (7 Marks)

ii) With neat diagrams explain the measurement of VSWR and wavelength. (6 Marks)

(Or)

b) Derive the expression of location and length of a single stub connected in parallel with the line. (13 marks)

11. a)i) A 300 Ω line is terminated in a load impedance such that VSWR is measured as 4.48 and the distance of the first voltage minima from the load is 6cm. Find the length and its location from the load for proper matching at 200 MHz. (10 Marks)

ii) Distinguish between single and double stub matching. (3 Marks)

(Or)

b) Explain how impedance matching can be achieved using two stubs in parallel with the transmission line.

(13 Marks)

PART C $(1 \times 15 = 15)$

12.a) A 30m long lossless transmission line with characteristic impedance of 50 Ω is terminated by a load impedance 60 + j 40 Ω. The operating wavelength is 90m. Using Smith chart, find the reflection coefficient, Standing wave ratio, location and length of short circuited stub.

(Or)

b) Using Smith chart, calculate the length of two short circuit stubs connected in parallel with the line which has normalized load admittance of 0.4-j1.2 mho.

<<<<<<<<<< ALL THE BEST >>>>>>>>>>